WATER RESOURCES REVIEW for

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

CANADA
DEPARTMENT OF THE ENVIRONMENT
WATER RESOURCES BRANCH

OCTOBER

1973

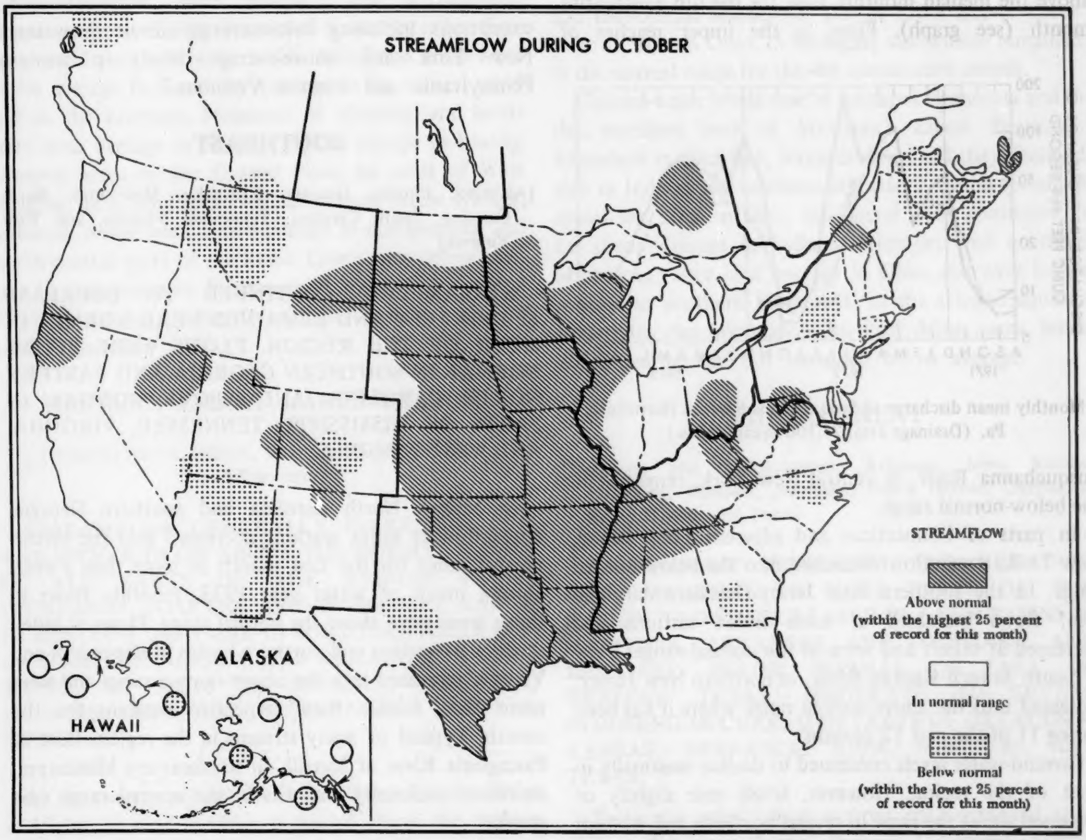
STREAMFLOW AND GROUND-WATER CONDITIONS

Streamflow increased seasonally in most of the United States, but generally decreased in southern Canada, Alaska, the central part of the Western region, and in smaller areas in the Southeastern and Northeastern regions.

Above-normal flows occurred in a broad band extending from Texas and Louisiana northward to Minnesota and North Dakota. Smaller areas of above-normal flow persisted in parts of the eastern Canadian Provinces and in some eastern and western States.

Flows remained in the below-normal range in two major areas in the West, and in parts of Alaska, Hawaii, Texas, and New York.

Moderate to severe flooding occurred in Texas, Oklahoma, Kansas, Nebraska, Iowa, and Missouri. Monthly mean flows were highest of record for October on many streams in those States.



CONTENTS OF THIS ISSUE: Northeast, Southeast, Western Great Lakes region, Midcontinent, West; Usable contents of selected reservoirs near end of October 1973; Flow of large rivers during October 1973; Alaska, Hawaii; Hydrographs of some large rivers, September 1971 to September 1973; Supplemental data for water year ending September 30, 1973; Resource and land information for south Dade County, Florida.

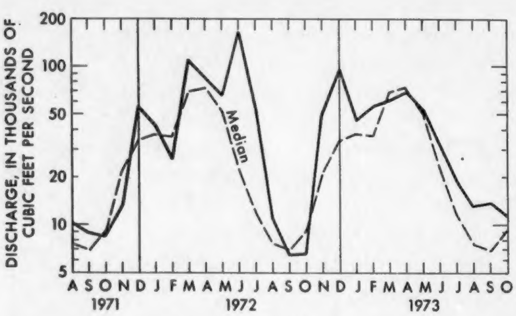
NORTHEAST

[Atlantic Provinces and Quebec; Delaware, Maryland, New York, New Jersey, Pennsylvania, and the New England States]

STREAMFLOW REMAINED ABOVE NORMAL IN SOUTHEASTERN QUEBEC AND NORTHERN NOVA SCOTIA, BUT WAS BELOW NORMAL IN NEW BRUNSWICK, SOUTHERN NOVA SCOTIA, AND PARTS OF NEW YORK AND CONNECTICUT. FLOWS GENERALLY INCREASED IN QUEBEC AND THE NORTHERN NEW ENGLAND STATES, AND DECREASED IN PARTS OF ALL OTHER STATES IN THE REGION AS WELL AS IN THE PROVINCE OF NEW BRUNSWICK.

Streamflow at index stations in southeastern Quebec and northern Nova Scotia increased and remained above the normal range in contrast to the below-normal flows in New Brunswick and southern Nova Scotia.

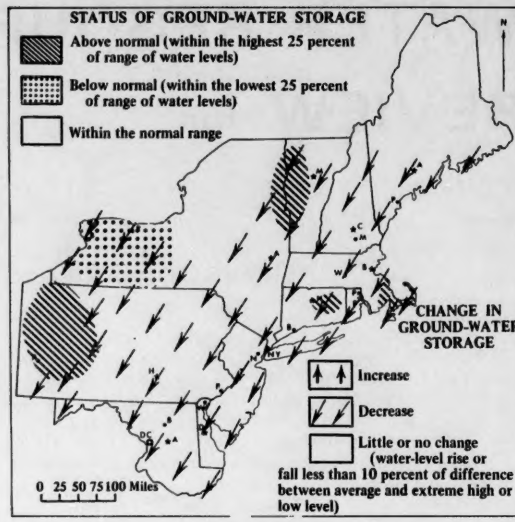
In central Pennsylvania, flow of Susquehanna River at Harrisburg decreased into the normal range but was above the median monthly flow for the 6th consecutive month (see graph). Flow in the upper reaches of Susquehanna River, in central New York, remained in the below-normal range.



Monthly mean discharge of Susquehanna River at Harrisburg, Pa. (Drainage area, 24,100 square miles.)

In parts of Connecticut and adjacent Long Island, New York, streamflow decreased into the below-normal range. In the southern New Jersey-Delaware-Maryland area, flows increased at some index stations and decreased at others and were in the normal range. Flow of South Branch Raritan River, in northern New Jersey, increased into the above-normal range where it has been during 11 of the past 12 months.

Ground-water levels continued to decline seasonally in most of the region. However, levels rose slightly or remained about the same in several northern and western areas including most of Maine, northeastern New York, and western Pennsylvania (see map). Monthend levels were generally within the normal range, with some exceptions including below-average levels in western New York and above-average levels in western Pennsylvania and western Vermont.



Map shows ground-water storage near end of October and change in ground-water storage from end of September to end of October.

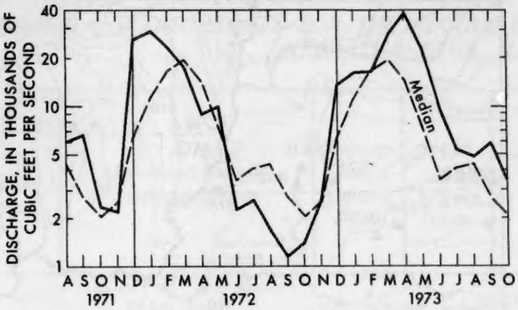
SOUTHEAST

[Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia]

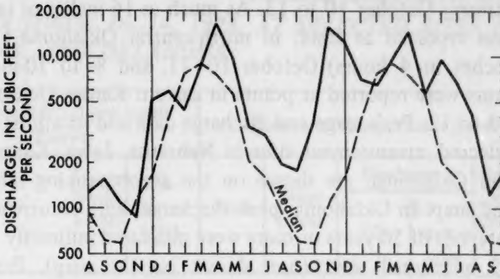
STREAMFLOW CONTINUED TO DECREASE SEASONALLY AND REMAINED NEAR NORMAL IN MUCH OF THE REGION. FLOWS WERE BELOW NORMAL IN SOUTHERN GEORGIA AND EASTERN NORTH CAROLINA AND ABOVE NORMAL IN PARTS OF MISSISSIPPI, TENNESSEE, VIRGINIA, AND WEST VIRGINIA.

In eastern North Carolina and southern Georgia, streamflow at index stations decreased into the below-normal range for the first month in more than a year. During much of water year 1973, monthly flows in those areas were above the normal range. Flows at index stations in western and northern basins in Mississippi and Virginia increased into the above-normal range and were more than double their respective medians for the month. Typical of many streams in the region, flow of Pascagoula River at Merrill, in southeastern Mississippi, decreased seasonally and was in the normal range (see graph).

In Florida, streamflow decreased and remained in the normal range in all parts of the State for the 2d consecutive month. Discharge of Silver Springs, in the



Monthly mean discharge of Pascagoula River at Merrill, Miss.
(Drainage area, 6,600 square miles.)



Monthly mean discharge of Scioto River at Higby, Ohio.
(Drainage area, 5,131 square miles.)

north, remained unchanged at 780 cfs; 93 percent of normal. In the Everglades area, flow southward through the Tamiami canal outlets, 40-mile bend to Monroe, decreased 269 cfs, to 352 cfs; 59 percent of normal. Also, in the south, flow of Miami Canal at Miami decreased 47 cfs to 383 cfs; 78 percent of normal.

Ground-water levels declined seasonally in most of the region. However, levels generally rose in northern Florida and rose slightly in most of Kentucky other than the central part, where levels fell. Monthend levels were above average in Kentucky (except in the central part) and in the northern Piedmont of Virginia; and levels were near average in North Carolina except in heavily pumped areas of the Coastal Plain. In most of West Virginia, monthend levels were average or below average; however, levels were above average in northeastern and north-central parts of the State. Levels were below average in the southern Piedmont of Virginia, in central Florida, and in the heavily pumped Savannah area of coastal Georgia.

WESTERN GREAT LAKES REGION

[Ontario; Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin]

STREAMFLOW GENERALLY INCREASED AND WAS EITHER IN OR ABOVE THE NORMAL RANGE IN ALL PARTS OF THE REGION. FLOWS INCREASED INTO THE ABOVE-NORMAL RANGE IN EASTERN OHIO AND IN SOUTHERN AND EAST-CENTRAL MINNESOTA, AND REMAINED IN THAT RANGE IN PARTS OF ONTARIO, WISCONSIN, ILLINOIS, OHIO, AND WESTERN AND CENTRAL MINNESOTA.

In the eastern part of the region, flow of Scioto River at Higby, in central Ohio, remained above the median for the 5th consecutive month (see graph), and flow of Missinaibi River at Mattice, in eastern Ontario, remained in the above-normal range where it has been since July. In northeastern Wisconsin and northern Illinois, monthly mean flows of Oconto River near Gillett and Pecatonica River at Freeport have been above the normal range for 10 and 15 consecutive months, respectively. At Freeport, the mean annual discharge during the water year ending September 30, 1973 was the highest in 59 years of record.

Flows increased and were above the normal range in the Minnesota and Mississippi River basins of southern and east-central Minnesota, and in Little Beaver Creek basin in eastern Ohio. In Michigan, streamflow remained in the normal range for the 4th consecutive month.

Ground-water levels rose in northern Minnesota and in the northern part of Michigan's Lower Peninsula. Elsewhere in Michigan, levels declined and they declined also in Indiana and southern Minnesota. Levels remained about the same in Ohio. Monthend levels continued to be above average in Indiana, Michigan, and northern Minnesota; were near average in Ohio; and were below average in southern Minnesota. In the artesian aquifers underlying the Minneapolis-St. Paul, Minn., area, levels continued to rise but remained below average.

MIDCONTINENT

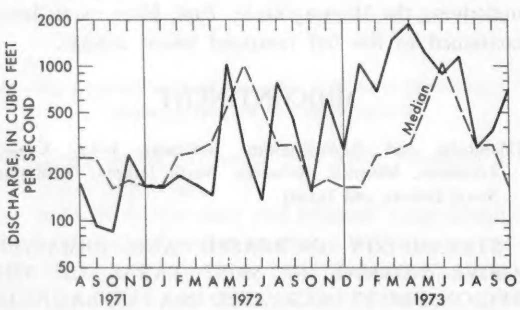
[Manitoba and Saskatchewan; Arkansas, Iowa, Kansas, Louisiana, Missouri, Nebraska, North Dakota, Oklahoma, South Dakota, and Texas]

STREAMFLOW INCREASED AND REMAINED ABOVE NORMAL IN MOST PARTS OF THE REGION. FLOWS DECREASED IN A FEW BASINS IN MANITOBA, ARKANSAS, AND LOUISIANA, AND REMAINED BELOW NORMAL IN PART OF WESTERN TEXAS. MODERATE TO SEVERE FLOODING OCCURRED IN PARTS OF OKLAHOMA, KANSAS, NEBRASKA, IOWA, MISSOURI, AND TEXAS.

Torrential rains, along a front that extended from eastern Texas northward through Oklahoma, Kansas, Missouri, and into southeastern Nebraska and southern Iowa, caused moderate to severe flooding on many

streams October 10 to 13. As much as 16 inches of rain was reported at Enid, in north-central Oklahoma (12 inches in 4 hours) October 10–11, and 8- to 10-inch rains were reported at points in eastern Kansas October 10 to 12. Peak stage and discharge data and locations of selected measurement sites in Nebraska, Iowa, Kansas, and Oklahoma, are shown on the accompanying table and map. In Oklahoma, peak discharges with recurrence intervals of 50 years or more were measured indirectly at 15 additional sites (not shown on the map). Peak discharges in Texas were less than those of a 50-year flood, and those in Missouri were less than the maximum discharges previously known within the period of record on several tributaries to Missouri and Mississippi Rivers.

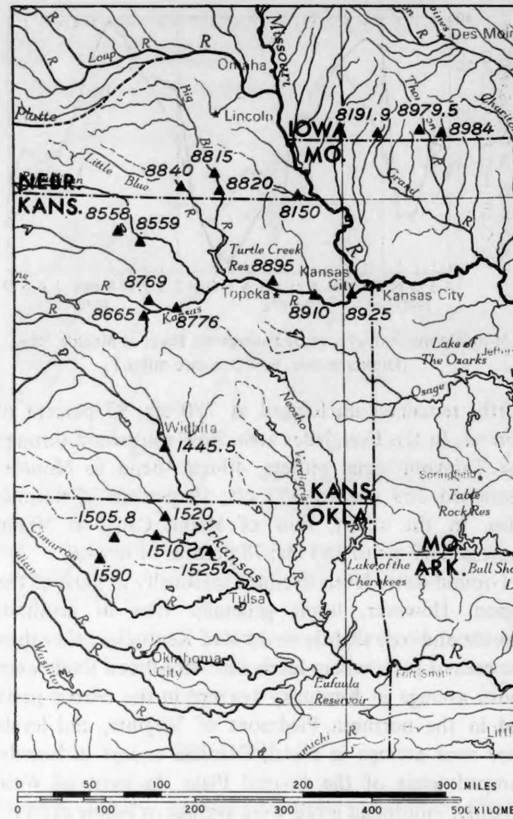
Recordbreaking monthly and daily mean discharges occurred at many index stations in the southern part of the region. For example, the October monthly mean discharges of 4,750 cfs on Neches River near Rockland (drainage area, 3,687 square miles), and 1,487 cfs on Guadalupe River near Spring Branch (drainage area, 1,315 square miles), in eastern and south-central Texas, were highest in 70 and 51 years of record, respectively. In Missouri, the monthly mean of 9,139 cfs, and the daily mean of 55,200 cfs on October 13, were the highest in 58 years of record on Grand River near Gallatin (drainage area, 2,250 square miles). In northern Kansas, flooding on Little Blue River near Barnes near the end of September, and again in early October, resulted in September and October monthly mean discharges of 3,710 cfs and 6,929 cfs, highest of record for those respective months (see graph). The associated maximum daily discharges of 20,700 cfs on September



Monthly mean discharge of Little Blue River near Barnes, Kans. (Drainage area, 3,330 square miles.)

28, and 54,700 cfs on October 12, also were highest in the 22 years of record for that index station. And in southwestern Louisiana, the monthly mean flow of 1,398 cfs on Calcasieu River near Oberlin (drainage area, 753 square miles) was more than 12 times the October median, and highest for the month in 38 years of record.

Very high, although not recordbreaking, monthly



Locations of stream-gaging stations described in table of peak stages and discharges on page 5.

mean flows, varying from about 3 to 13 times the October medians, occurred elsewhere in Louisiana, and in parts of Arkansas, Oklahoma, Iowa, Nebraska, South Dakota, and North Dakota.

Ground-water levels generally rose as a result of recharge from heavy rains, especially in the central part of the region. Levels changed only slightly in Louisiana (except for rises in the Chicot aquifer in the southwest); and continued to decline and remain below average in North Dakota. Monthend levels were above average in most of Iowa but were below average in the northeast corner of the State. In the Sparta Sand in Louisiana, monthend levels were lowest of record for October in the rice-growing Grand Prairie area; were below average also at Pine Bluff; and were above average at El Dorado. In Texas, levels rose in the Edwards Limestone at San Antonio, were unchanged in the Evangeline aquifer at Houston, and declined in the Edwards Limestone at Austin and in the bolson deposits at El Paso. Monthend levels were above average at Austin (new October high) and San Antonio; and below average at El Paso (new alltime low) and Houston.

Provisional data; subject to revision

STAGES AND DISCHARGES FOR THE FLOODS OF OCTOBER 10–14, 1973, AT SELECTED SITES IN NEBRASKA, IOWA, KANSAS, AND OKLAHOMA

WRD station number	Stream and place of determination	Drainage area (square miles)	Period of known floods	Maximum flood previously known: Date	Stage (feet)	Discharge (cfs)	Maximum during present flood: Date	Stage (feet)	Discharge: Cfs	Cfs per square mile	Recurrence interval (years)
NEBRASKA											
BIG NEMAHA RIVER BASIN											
6-8150	Big Nemaha River at Falls City.	1,340	1944–	June 17, 1954	27.44	51,400	Oct. 11	31.4	70,000	52.2	100
KANSAS RIVER BASIN											
6-8815	Big Blue River at Beatrice . . .	3,900	1906–	June 4, 1951	28.3	34,000	12	33.0	50,000	12.8	75+
6-8820	Big Blue River at Barneston.	4,444	1932–	June 9, 1941	34.3	57,700	12	32.2	46,600	11.5	40
6-8840	Little Blue River near Fairbury.	2,350	1908–15, 1928–	June 27, 1951	[a]16.82	36,800	12	18.6	37,000	15.7	50
IOWA											
PLATTE RIVER BASIN (Iowa-Missouri)											
6-8191.9	East Fork One Hundred and Two River near Bedford.	92.1	1959–	Jan. 12, 1960 Apr. 26, 1969	20.95 15.95	5,400 7,160	Oct. 11	20.7	12,000	130	100
GRAND RIVER BASIN											
6-8979.5	Elk Creek near Decatur City.	52.5	1967–	June 14, 1967	18.35	15,000	11	17.1	12,000	229	100
6-8984	Weldon River near Leon	104	1958–	Aug. 6, 1959	25.27	48,600	11	21.4	10,000	96	[b]1.4
KANSAS											
KANSAS RIVER BASIN											
6-8558	Buffalo Creek near Jamestown.	330	1959–	Sept. 12, 1961	19.31	18,800	Oct. 12	19.71	30,000	90.9	100+
6-8559	Wolf Creek near Concordia.	56	1962–	Aug. 10, 1968	17.25	2,800	11	17.95	4,000	71.4	50
6-8665	Smoky Hill River near Mentor.	8,358	1923–32, 1947–	Aug. 17, 1927	[a]26.2	25,500	11	24.8	27,000	3.2	100+
6-8769	Solomon River at Niles	6,770	1897–1903, 1917–	July 14, 1951	31.76	178,000	11	31.02	50,000	7.4	100+
6-8776	Smoky Hill River at Enterprise.	19,260	1934–	July 14, 1951	33.96	233,000	13	26.80	46,000	2.4	50
6-8895	Soldier Creek near Topeka.	290	1929–32, 1935–	June 12, 1967	20.11	18,600	11	23.8	21,000	72.4	100+
6-8910	Kansas River at Lecompton.	58,460	1936–	July 13, 1951	30.23	483,000	12	23.0	150,000	(c)	50
6-8925	Kansas River at Bonner Springs.	59,928	1917–	July 13, 1951	44.2	510,000	12	27.0	140,000	(c)	50
ARKANSAS RIVER BASIN											
7-1445.5	Arkansas River at Derby	40,830	1968–	Oct. 17, 1968	13.53	27,300	14	15.43	40,000	(c)	100
OKLAHOMA											
ARKANSAS RIVER BASIN											
7-1505.8	Sand Creek tributary near Kremlin.	7.21	. . . .	Oct. 1957	9	. . . . . .	Oct. 10	[d]13.1	[e]12,000	1,664	100
7-1510	Salt Fork Arkansas River near Tonkawa.	4,528	1935	May 20, 1938	22.82	40,800	11	28.9	90,000	20.0	[a]2.2
7-1520	Chikaskia River near Blackwell.	1,859	1935–	June 22, 1942	33.3	85,000	11	33.7	70,000	37.6	25
7-1525	Arkansas River at Ralston . . .	54,465	1925–	Apr. 25, 1944	22.82	179,000	13	22.90	190,000	(c)	25
7-1590	Turkey Creek near Drummond.	248	1948–	May 16, 1957	21.6	18,800	10	25.9	30,000	121	100

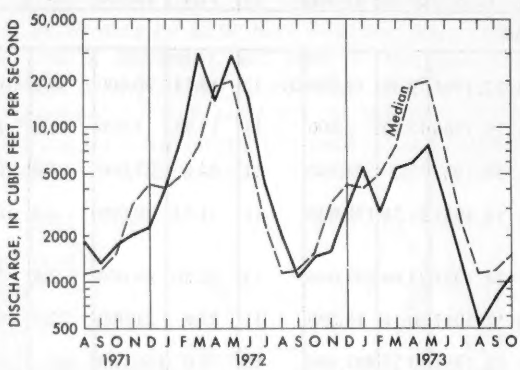
[a]Site and datum then in use.
[b]Ratio of discharge to that of 100-year flood.
[c]Large part of drainage area is noncontributing.
[d]About 4 feet higher than previous maximum in at least 43 years.
[e]Estimated.

WEST

[Alberta and British Columbia; Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming]

STREAMFLOW GENERALLY INCREASED IN THE WESTERN HALF OF THE REGION, BUT IN THE EASTERN HALF FLOWS DECREASED IN SOME BASINS AND INCREASED IN OTHERS. THE LARGE AREA OF BELOW-NORMAL SEPTEMBER STREAMFLOW IN THE NORTHWEST DECREASED APPRECIABLY BUT DROUGHT CONDITIONS AND LOW FLOWS PERSISTED IN PARTS OF MONTANA, IDAHO, WASHINGTON, AND THE PROVINCE OF ALBERTA. FLOWS REMAINED BELOW NORMAL ALSO IN PARTS OF ARIZONA, NEW MEXICO, AND UTAH. FLOWS REMAINED ABOVE NORMAL IN PARTS OF THE CENTRAL THIRD OF THE REGION AS A RESULT OF HIGH CARRYOVER FLOWS FROM SEPTEMBER, AUGMENTED BY OCTOBER RAINS.

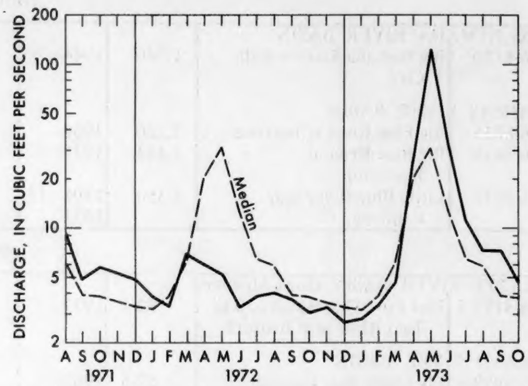
Monthly mean flow of Spokane River at Spokane (drainage area, 4,290 square miles), in eastern Washington, increased seasonally but remained below median, where it has been almost the entire 13-month period since September 1972 (see graph). Drought



Monthly mean discharge of Spokane River at Spokane, Wash. (Drainage area, 4,290 square miles.)

conditions continued in western and north-central parts of Montana where the monthly mean discharge of 2,488 cfs on Clark Fork at St. Regis (drainage area, 10,709 square miles), was the lowest for October since 1940, and the mean of 125 cfs on Marias River near Shelby (drainage area, 3,242 square miles), was lowest for the month since 1938. In the southern part of the region, the monthly mean flow of 2.94 cfs on San Pedro River at Charleston, Arizona (drainage area, 1,219 square miles), was lowest for October since records began in 1913. No precipitation has occurred in most parts of Arizona for more than two months and flow has ceased in Little Colorado River near Cameron, in the north. In southeastern Arizona and the adjacent areas of southwestern New Mexico, flow of Gila River remained below the normal range for the 2d consecutive month.

In northern New Mexico, flow of Rio Grande at Otowi Bridge near San Ildefonso increased and was above the normal range. Flow in the adjacent basin of Rayado Creek decreased at the index station at Sauble Ranch near Cimarron but remained above the median for the 7th consecutive month (see graph).



Monthly mean discharge of Rayado Creek at Sauble Ranch near Cimarron, N.Mex. (Drainage area, 65 square miles.)

Streamflow in California generally remained in the normal range except in the north-coastal area where flow of Smith River near Cresent City increased to 3 times the October median and remained above the normal range for the 2d consecutive month. In the northern part of the region, the monthly mean flows of Fraser River at Hope, British Columbia, and Columbia River at The Dalles, Oregon, increased and were in or slightly above the normal range for October.

In northern and eastern Utah, flows generally were above normal, but in the southwest, flow of Virgin River remained in the below-normal range. Also in the north, the level of Great Salt Lake rose 0.05 foot (to 4,199.35 feet above mean sea level), 1.05 feet higher than a year ago, and 8.00 feet above the alltime low of October 1963.

Reservoir storage at monthend generally was near or above average except in Idaho, Washington, and Oregon, where shortages exist.

Ground-water levels generally declined in Montana, western Washington, and northern Nevada; and rose in most of Utah, east-central Nevada, eastern Washington, and southern New Mexico. In southern Idaho, the level in the observation well penetrating the sand and gravel aquifer in the Boise Valley, began its seasonal decline

(Continued on page 9.)

USABLE CONTENTS OF SELECTED RESERVOIRS NEAR END OF OCTOBER 1973

[Contents are expressed in percent of reservoir capacity. The usable storage capacity of each reservoir is shown in the column headed "Normal maximum."]

Reservoir Principal uses: F–Flood control I–Irrigation M–Municipal P–Power R–Recreation W–Industrial	End of Sept. 1973	End of Oct. 1973	End of Oct. 1972	Average for end of Oct.	Normal maximum
	Percent of normal maximum				
NORTHEAST REGION					
NOVA SCOTIA					
Rossignol, Mulgrave, Falls Lake, St. Margaret's Bay, Black, and Ponhook Reservoirs (P)	62	48	36	32	223,400 (a)
QUEBEC					
Gouin (P)	95	94	63	71	10,865 ac-ft
Allard (P)	89	82	86	53	438 ac-ft
MAINE					
Seven reservoir systems (MP)	75	70	58	50	178,489 mcf
NEW HAMPSHIRE					
Lake Winnipesaukee (PR)	71	59	63	51	7,200 mcf
Lake Francis (FPR)	82	62	76	75	4,326 mcf
First Connecticut Lake (P)	76	65	79	76	3,330 mcf
VERMONT					
Somerset (P)	61	59	61	68	2,500 mcf
Harriman (P)	62	55	60	60	5,060 mcf
MASSACHUSETTS					
Cobble Mountain and Borden Brook (MP)	69	64	66	71	3,394 mcf
NEW YORK					
Great Sacandaga Lake (FPR)	60	48	52	55	34,270 mcf
Indian Lake (FMP)	75	66	81	51	4,500 mcf
New York City reservoir system (MW)	82	70	68	......	547,500 mg
NEW JERSEY					
Wanaque (M)	72	61	57	63	27,730 mg
PENNSYLVANIA					
Wallenpaupack (P)	63	45	59	45	6,875 mcf
Pymatuning (FMR)	86	83	91	75	8,191 mcf
MARYLAND					
Baltimore municipal system (M)	96	93	98	82	85,340 mg
SOUTHEAST REGION					
NORTH CAROLINA					
Bridgewater (Lake James) (P)	78	75	78	79	12,580 mcf
High Rock Lake (P)	74	68	50	57	10,230 mcf
Narrows (Badin Lake) (P)	98	97	93	95	5,616 mcf
SOUTH CAROLINA					
Lake Murray (P)	84	82	80	59	70,300 mcf
Lakes Marion and Moultrie (P)	98	82	86	61	81,100 mcf
SOUTH CAROLINA--GEORGIA					
Clark Hill (FP)	77	70	55	50	75,360 mcf
GEORGIA					
Burton (PR)	81	72	69	63	104,000 ac-ft
Lake Sidney Lanier (FMPR)	61	58	40	48	1,686,000 ac-ft
Sinclair (MPR)	88	80	61	69	214,000 ac-ft
ALABAMA					
Lake Martin (P)	84	81	59	63	1,373,000 ac-ft
TENNESSEE VALLEY					
Clinch Projects: Norris and Melton Hill Lakes (FPR)	46	39	47	32	1,156,000 cfsd
Holston Projects: South Holston, Watauga, Boone, Fort Patrick Henry, and Cherokee Lakes (FPR)	58	52	63	36	1,452,000 cfsd
Douglas Lake (FPR)	35	24	37	22	703,100 cfsd
Hiwassee Projects: Chatuge, Nottely, Hiwassee, Apalachia, Blue Ridge, Ocoee 3, and Parksville Lakes (FPR)	70	57	54	47	512,200 cfsd
Little Tennessee Projects: Nantahala, Thorpe, Fontana, and Chilhowee Lakes (FPR)	75	62	64	47	745,200 cfsd
WESTERN GREAT LAKES REGION					
WISCONSIN					
Chippewa and Flambeau (PR)	79	91	96	75	15,900 mcf
Wisconsin River (21 reservoirs) (PR)	60	52	93	63	17,400 mcf
MINNESOTA					
Mississippi River headwater system (FMR)	33	41	32	29	1,640,000 ac-ft

[a] Thousands of kilowatt-hours

Reservoir Principal uses: F–Flood control I–Irrigation M–Municipal P–Power R–Recreation W–Industrial	End of Sept. 1973	End of Oct. 1973	End of Oct. 1972	Average for end of Oct.	Normal maximum
	Percent of normal maximum				
MIDCONTINENT REGION					
NORTH DAKOTA					
Lake Sakakawea (Garrison) (FIPR)	95	94	96	......	22,640,000 ac-ft
NEBRASKA					
Lake McConaughy (IP)	86	84	75	65	1,948,000 ac-ft
OKLAHOMA					
Keystone (FPR)	87	124	79	86	661,000 ac-ft
Lake O' The Cherokees (FPR)	85	112	92	81	1,492,000 ac-ft
Tenkiller Ferry (FPR)	93	118	80	87	628,200 ac-ft
Lake Altus (FIMR)	42	47	9	46	134,500 ac-ft
Eufaula (FPR)	87	102	70	82	2,378,000 ac-ft
OKLAHOMA--TEXAS					
Lake Texoma (FMPRW)	103	104	75	91	2,722,000 ac-ft
TEXAS					
Possum Kingdom (IMPRW)	86	89	95	80	724,500 ac-ft
Buchanan (IMPW)	61	81	78	78	955,200 ac-ft
Bridgeport (IMW)	67	52	51	42	386,400 ac-ft
Eagle Mountain (IMW)	94	99	90	86	190,300 ac-ft
Medina Lake (I)	100	100	98	48	254,000 ac-ft
Lake Travis (FIMPRW)	96	100	87	77	1,144,000 ac-ft
Lake Kemp (IMW)	42	59	45	75	319,600 ac-ft
THE WEST					
ALBERTA					
Spray (p)	85	84	81	80	210,000 ac-ft
Lake Minnewanka (p)	93	92	89	86	199,700 ac-ft
St. Mary (I)	57	48	66	64	320,800 ac-ft
WASHINGTON					
Franklin D. Roosevelt Lake (IP)	82	89	98	97	5,232,000 ac-ft
Lake Chelan (PR)	85	74	78	73	676,100 ac-ft
IDAHO--WYOMING					
Upper Snake River (7 reservoirs) (IMP)	40	48	73	49	4,282,000 ac-ft
WYOMING					
Pathfinder, Seminoe, Alcova, Kortes, Glendo, and Guernsey Reservoirs (I)	68	68	60	37	3,056,200 ac-ft
Buffalo Bill (IP)	59	52	82	75	421,300 ac-ft
Boysen (FIP)	100	97	85	81	802,000 ac-ft
Keyhole (F)	75	78	85	34	199,900 ac-ft
COLORADO					
John Martin (FIR)	0	0	0	13	364,400 ac-ft
Colorado–Big Thompson project (I)	83	82	71	53	722,600 ac-ft
Taylor Park (IR)	91	73	33	52	106,000 ac-ft
COLORADO RIVER STORAGE PROJECT					
Lake Powell; Flaming Gorge, Navajo, and Blue Mesa Reservoirs (IFPR)	72	93	57	......	31,276,500 ac-ft
UTAH--IDAHO					
Bear Lake (IPR)	81	79	85	44	1,421,000 ac-ft
CALIFORNIA					
Hetch Hetchy (MP)	73	61	49	47	360,400 ac-ft
Lake Almanor (P)	86	84	76	45	1,036,000 ac-ft
Shasta Lake (FIPR)	76	74	75	64	4,377,000 ac-ft
Millerton Lake (FI)	29	32	36	31	503,200 ac-ft
Pine Flat (FI)	43	44	24	34	1,014,000 ac-ft
Isabella (FIR)	41	38	9	20	551,800 ac-ft
Folsom (FIP)	74	88	61	46	1,000,000 ac-ft
Lake Berryessa (FIMW)	87	86	71	73	1,600,000 ac-ft
Clair Engle Lake (Lewiston) (P)	79	78	76	71	2,438,000 ac-ft
CALIFORNIA--NEVADA					
Lake Tahoe (IPR)	67	61	61	125	744,600 ac-ft
NEVADA					
Rye Patch (I)	74	67	80	......	157,200 ac-ft
ARIZONA--NEVADA					
Lake Mead and Lake Mohave (FIMP)	77	77	69	67	27,970,000 ac-ft
ARIZONA					
San Carlos (IP)	60	58	31	12	1,093,000 ac-ft
Salt and Verde River system (IMPR)	77	74	55	32	2,073,000 ac-ft
NEW MEXICO					
Conchas (FIR)	81	73	60	77	352,600 ac-ft
Elephant Butte and Caballo (FIPR)	28	28	10	24	2,539,000 ac-ft

METRIC EQUIVALENTS OF UNITS USED IN THE WATER RESOURCES REVIEW

(Round-number conversions, to nearest four significant figures)

1 foot = 0.3048 meter 1 mile = 1.609 kilometers
1 acre = 0.4047 hectare = 4,047 square meters
1 square mile = 259 hectares = 2.59 square kilometers
1 acre-foot (ac-ft) = 1,233 cubic meters
1 million cubic feet (mcf) = 28,320 cubic meters
1 cubic foot per second (cfs) = 0.02832 cubic meters per second = 1.699 cubic meters per minute
1 second-foot-day (cfsd) = 2,447 cubic meters per day
1 million gallons (mg) = 3,785 cubic meters = 3.785 x 10^6 liters
1 million gallons per day (mgd) = 694.4 gallons per minute (gpm) = 2.629 cubic meters per minute = 3,785 cubic meters per day

Provisional data; subject to revision

FLOW OF LARGE RIVERS DURING OCTOBER 1973

Station number	Stream and place of determination	Drainage area (square miles)	Mean annual discharge through September 1970 (cfs)	October 1973					
				Monthly discharge (cfs)	Percent of median monthly discharge[1]	Change in discharge from previous month (percent)	Discharge near end of month		
							(cfs)	(mgd)	Date
1-0140	St. John River below Fish River at Fort Kent, Maine.	5,690	9,397	2,400	51	-45	2,400	1,600	31
1-3580	Hudson River at Green Island, N.Y.	8,090	12,520	...	...	...	...	...	...
1-4635	Delaware River at Trenton, N.J	6,780	11,360	4,892	122	-9	13,200	8,500	30
1-5705	Susquehanna River at Harrisburg, Pa.	24,100	33,670	11,480	146	-17	14,000	9,000	31
1-6465	Potomac River near Washington, D.C.	11,560	[2]10,640	5,270	185	+29	30,000	19,400	30
2-1055	Cape Fear River at William O. Huske Lock near Tarheel, N.C.	4,810	4,847	747	35	-35	870	560	31
2-1310	Pee Dee River at Peedee, S.C	8,830	9,098	4,680	101	-13	2,300	14,900	29
2-2260	Altamaha River at Doctortown, Ga.	13,600	13,380	5,176	98	+13	3,830	2,500	24
2-3205	Suwannee River at Branford, Fla	7,740	6,775	4,400	96	-29	3,930	2,500	27
2-3580	Apalachicola River at Chattahoochee, Fla.	17,200	21,690	11,400	104	-14	10,400	6,700	30
2-4670	Tombigbee River at Demopolis lock and dam near Coatopa, Ala.	15,400	21,700	4,402	164	+10	2,100	1,400	29
2-4895	Pearl River near Bogalusa, La	6,630	8,533	3,099	156	-14	2,960	1,900	26
3-0495	Allegheny River at Natrona, Pa	11,410	[2]18,700	7,250	166	+100	5,740	3,700	29
3-0850	Monongahela River at Braddock, Pa.	7,337	[2]11,950	5,760	183	+36	3,800	2,500	29
3-1930	Kanawha River at Kanawha Falls, W.Va.	8,367	12,370	5,388	119	+46	3,340	2,200	25
3-2345	Scioto River at Higby, Ohio	5,131	4,337	1,800	309	+45	828	540	28
3-2945	Ohio River at Louisville, Ky[3]	91,170	110,600	34,500	153	+60	19,000	12,300	28
3-3775	Wabash River at Mount Carmel, Ill.	28,600	26,310	7,510	147	-7	6,600	4,300	31
3-4690	French Broad River below Douglas Dam, Tenn.	4,543	[2]6,528	[2]3,113	89	-4	...	...	...
4-0845	Fox River at Rapide Croche Dam, near Wrightstown, Wis.[3]	6,150	4,142	2,600	122	+23	...	...	...
4-2643.31	St. Lawrence River at Cornwall, Ontario–near Massena, N.Y.[4]	299,000	239,100	306,000	130	-3	280,000	181,000	31
5-0825	Red River of the North at Grand Forks N. Dak.	30,100	2,439	3,697	271	+29	2,800	1,800	31
5-3300	Minnesota River near Jordan, Minn	16,200	3,306	2,190	229	+312	1,450	940	31
5-3310	Mississippi River at St. Paul, Minn	36,800	[2]10,230	17,670	274	+223	18,600	12,000	30
5-3655	Chippewa River at Chippewa Falls, Wis.	5,600	5,062	5,475	212	+62	...	...	...
5-4070	Wisconsin River at Muscoda, Wis	10,300	8,457	6,485	118	-3	5,930	3,800	31
5-4465	Rock River near Joslin, Ill	9,520	5,288	8,285	344	+58	6,170	4,000	29
5-4745	Mississippi River at Keokuk, Iowa	119,000	61,210	83,600	263	+61	79,500	51,400	31
5-4905	Des Moines River at Keosauqua, Iowa.	14,038	5,220	20,000	1,304	+167	18,200	11,800	31
6-2145	Yellowstone River at Billings, Mont.	11,795	6,754	4,400	111	-21	3,990	2,600	31
6-9345	Missouri River at Hermann, Mo	528,200	78,480	219,400	396	+194	123,000	7,900	29
7-2890	Mississippi River near Vicksburg, Miss.[5]	1,144,500	552,700	543,000	205	+68	583,000	376,800	29
9-3150	Green River at Green River, Utah	40,600	6,369	3,728	150	+17	3,540	2,300	28
9-4025	Colorado River near Grand Canyon, Ariz.	137,800	...	8,130	...	+15	...	...	...
11-4255	Sacramento River at Verona, Calif	21,257	18,370	14,060	160	-10	13,600	8,800	29
13-2690	Snake River at Weiser, Idaho	69,200	17,670	14,120	97	+6	13,000	8,400	29
13-3170	Salmon River at White Bird, Idaho	13,550	11,060	4,127	84	+6	4,340	2,800	29
13-3425	Clearwater River at Spalding, Idaho	9,570	15,320	4,152	109	-43	4,630	3,000	29
14-1057	Columbia River at The Dalles, Oreg.[6]	237,000	194,000	110,000	110	+8	...	...	...
14-1910	Willamette River at Salem, Oreg	7,280	23,370	13,350	124	+75	17,000	11,000	27-31
15-5155	Tanana River at Nenana, Alaska	27,500	24,040	14,810	90	-48	10,000	6,500	31
8MF005	Fraser River at Hope, British Columbia.	78,300	95,300	74,900	98	+25	...	...	...

[1] Reference period 1931–60 or 1941–70.
[2] Adjusted.
[3] Record furnished by Corps of Engineers.
[4] Record furnished by Buffalo district, Corps of Engineers, through International St. Lawrence River Board of Control. Discharges shown are considered to be the same as discharge at Ogdensburg, N.Y. when adjusted for storage in Lake St. Lawrence.
[5] Records of daily discharge computed jointly by Corps of Engineers and Geological Survey.
[6] Discharge determined from information furnished by Bureau of Reclamation, Corps of Engineers, and Geological Survey.

and was slightly above average near monthend; monthend levels in wells representative of the Snake Plain aquifer were above average in the Atomic City and Eden areas and below average in the Rupert-Minidoka area. Monthend levels in southern Arizona were lowest of record for October in the observation wells at Aura Valley, Elfrida, and Willcox, and were at an alltime low at Nogales. Monthend levels were above-average in east-central Nevada; near average in Montana, eastern Washington, and southern California; and below average in most of Utah.

ALASKA

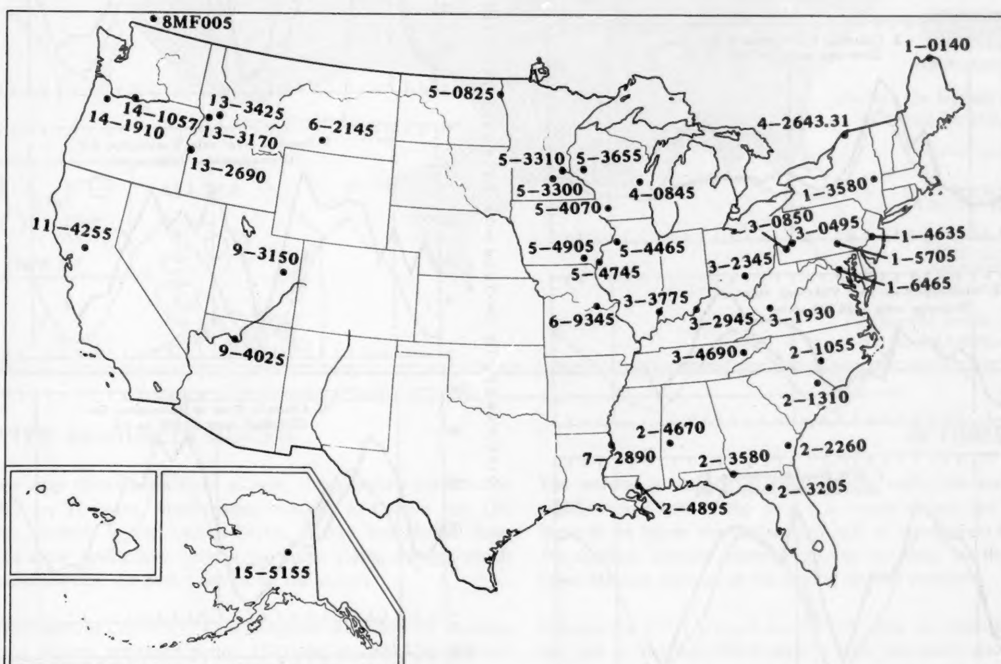
Streamflow decreased seasonally in all parts of the State, was below normal in south-central basins, and in the normal range elsewhere. Monthly mean flows at the index stations, Little Susitna River near Palmer, and Kenai River at Cooper Landing, were 71 and 52 percent of their respective October medians. Flow at Palmer has been in the below-normal range for 3 consecutive months, and at Cooper Landing, the monthly means have been in that range during 4 of the past 5 months.

Ground-water levels in the Anchorage area stayed about the same during the month in both the shallow and deep aquifers.

HAWAII

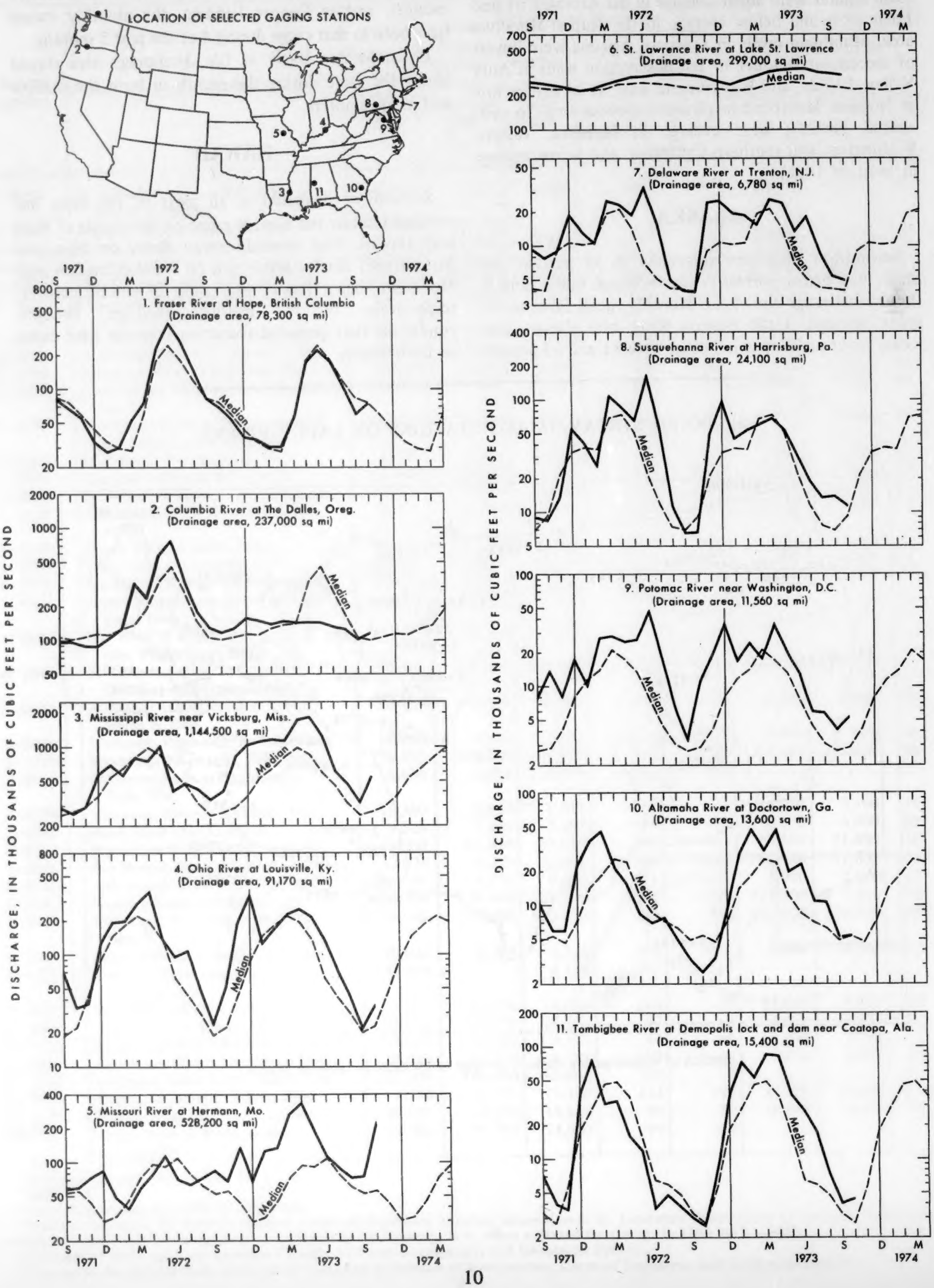
Streamflow increased in all parts of the State but remained below the normal range on the islands of Maui and Hawaii. The monthly mean flows on Honopou Stream near Huelo, Maui, and on Waiakea Stream near Mountain View, Hawaii, were only 27 and 50 percent, respectively, of the October medians. Drought conditions that persisted for several months have eased on both islands.

SELECTED STREAM-GAGING STATIONS ON LARGE RIVERS

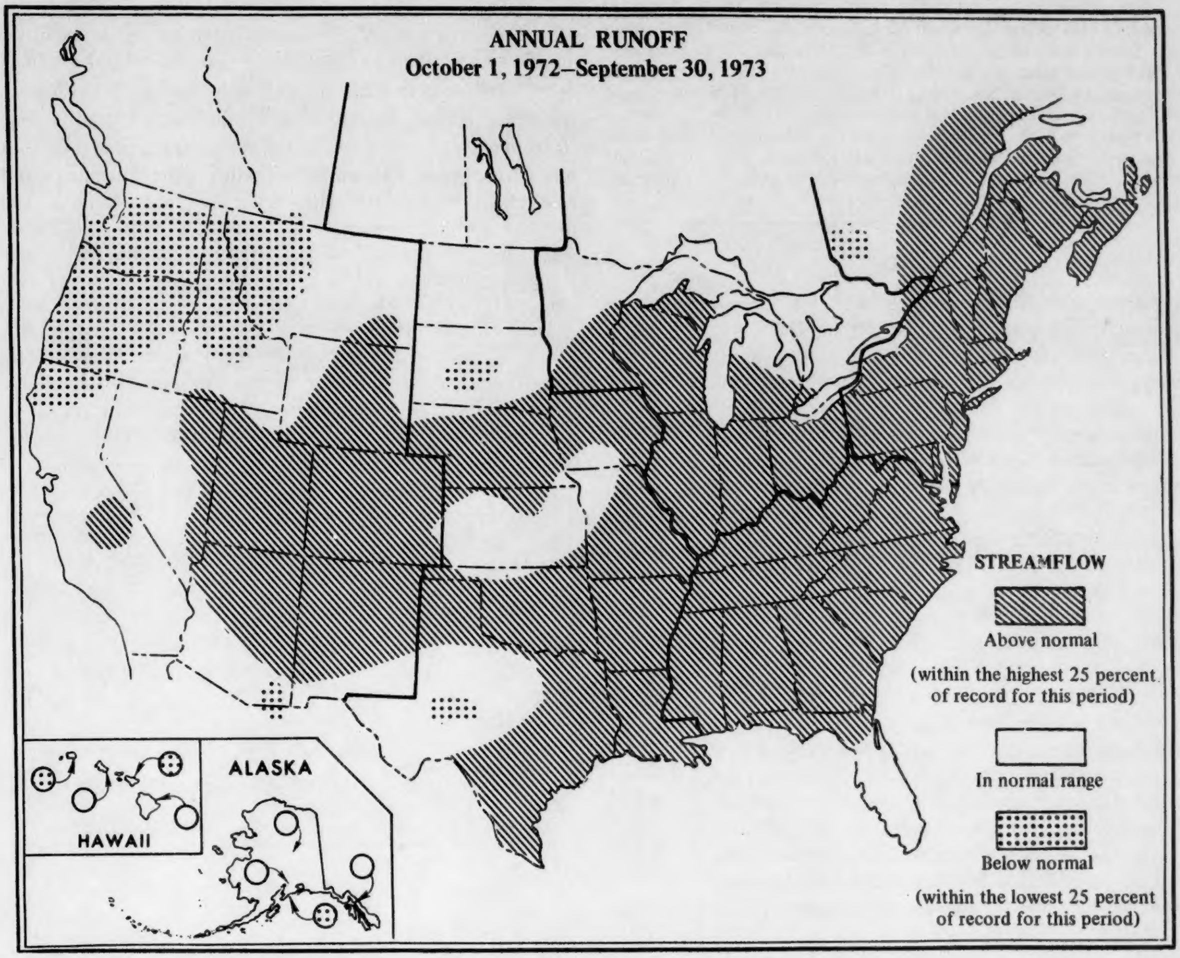


Location of stream-gaging stations on large rivers listed in table on page 8.

HYDROGRAPHS OF SOME LARGE RIVERS, SEPTEMBER 1971 TO SEPTEMBER 1973



SUPPLEMENTAL DATA FOR WATER YEAR ENDING SEPTEMBER 30, 1973



WATER RESOURCES REVIEW

OCTOBER 1973

Cover map shows generalized pattern of streamflow for October based on 22 index stream-gaging stations in Canada and 130 index stations in the United States. Alaska and Hawaii inset maps show streamflow only at the index gaging stations which are located near the points shown by the arrows.

Streamflow for October 1973 is compared with flow for October in the 30-year reference period 1931–60 or 1941–70. Streamflow is considered to be *below the normal range* if it is within the range of the low flows that have occurred 25 percent of the time (below the lower quartile) during the reference period. Flow for October is considered to be *above the normal range* if it is within the range of the high flows that have occurred 25 percent of the time (above the upper quartile).

Flow higher than the lower quartile but lower than the upper quartile is described as being within the *normal range.* In the Water Resources Review the median is obtained by ranking the 30 flows of the reference period in their order of magnitude; the highest flow is number 1, the lowest flow is number 30, and the average of the 15th and 16th highest flows is the median.

The normal is an average (but not an arithmetic average) or middle value; half of the time you would expect the October flows to be below the median and half of the time to be above the median. Shorter reference periods are used for the Alaska index stations because of the limited records available.

Statements about *ground-water levels* refer to conditions near the end of October. Water level in each key observation well is compared with average level for the end of October determined from the entire past record for that well or from a 20-year reference period, 1951–70. *Changes in ground-water levels,* unless described otherwise, are from the end of September to the end of October.

The Water Resources Review is published monthly. Special-purpose and summary issues are also published. Issues of the Review are free on application to the Water Resources Review, U.S. Geological Survey, Reston, Virginia 22092.

This issue was prepared by J.C. Kammerer, H.D. Brice, I.G. Grossman, and L.C. Fleshmon from reports of the field offices, November 8, 1973.

RESOURCE AND LAND INFORMATION FOR SOUTH DADE COUNTY, FLORIDA

The accompanying text and graphs are from the report, *Resource and land information for south Dade County, Florida:* U.S. Geological Survey Investigation (report) I-850, 66 pages, 1973; containing contributions from six Interior Department Bureaus; the Resource Management Office, Miccosukee Tribe; University of Miami, School of Medicine; and the Dade County Pollution Control Department. The report may be purchased for $2.45 either from the U.S. Geological Survey, National Center, Reston, Va. 22092, or from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 (GPO Stock Number 2401-02693).

CONCLUSION

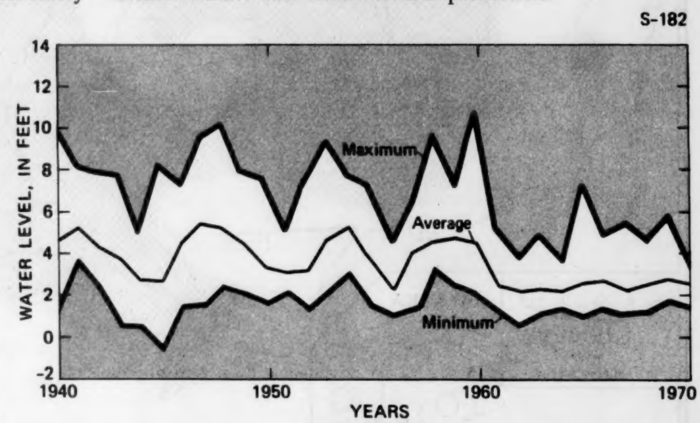
South Dade County is an area of intense environmental pressures, both internal and external. Here urbanization is replacing farming and pressing against the east boundary of Everglades National Park. Development has changed some of the estuarine areas from a mangrove swamp habitat to bulkheaded developments. The problems of water supply and waste disposal—particularly sewage—are inextricably linked to the regional water system that extends as far north as Lake Okeechobee. The environment of the south Dade area is totally water dependent.

Because south Florida is so flat, many of the normal engineering approaches cannot be used to solve water and related environmental problems. Water cannot be stored in reservoirs and moved readily. Water management, rather, has had to accommodate to the flatness of the area and its proximity to sea level (for example, the rise in low-water levels near the coast—see figure 1—helps retard sea-water intrusion). Moreover, the manipulation of the water system for the benefit of people could not be inimical to the balanced ecology of plants and animals. Much detailed data had to be collected before management schemes could be formulated and alternatives evaluated. The available data upon which the water management plans for south Florida are based have been collected over a period of many years. Natural resources data have been analyzed and correlated with other social, economic, and demographic data in development of these water management plans. Yet further stresses will require continual improvement in the water management plans. This in turn will require even more detailed resources data.

Planning in the south Dade area is predicated on available water. Hence this document has stressed the water management which has provided well for the past growth and aims at accommodating future planned growth. So complex and intertwined are the resources and the needs that detailed information is essential to sound planning. In this study, we have presented generalized data embracing the climate, topography, hydrology, pedology, biology, and geology of the area. Detailed data, which have been generalized for this study, are available to the planner.

Development of both regional plans and the management alternatives to implement these plans will become increasingly complex as environmental stresses increase with further development. Moreover, environmental problems develop faster than the information needed to address them is normally collected. Modelling of the environment, including social, economic and political constraints, will likely offer a means of evaluating the complex interactions of alternative plans. This modelling will require continual input and refinement of data. Although a veritable wealth of data on the natural resources of the area now exists, the sophisticated approaches of future planning, especially through modelling, will likely require both new types of data and greater detail of existing data.

Many organizations, both governmental and private, are concerned about the environment of south Florida. The Department of the Interior shares this concern. Land-use planning, based on realistic objectives and sound resource and environmental data, can accommodate growth commensurate with environmental protection.



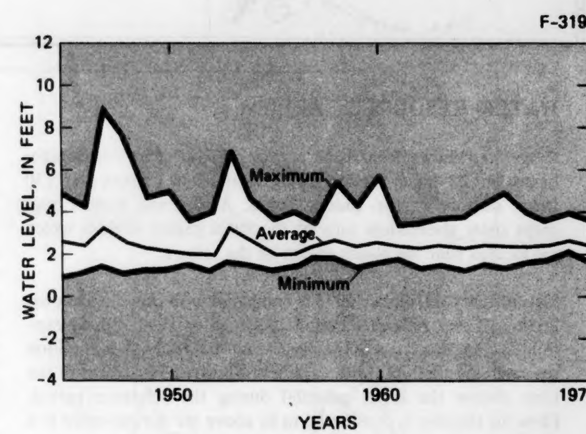


Figure 1.—In some coastal areas annual minimum water levels were raised as a result of the canal network, constructed between 1961 and 1967 to conserve water and prevent flooding of interior areas. Shown here are water levels for 2 wells near the coast.

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